CITY AND COUNTY OF SAN FRANCISCO

PUBLIC UTILITIES COMMISSION

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Necessity of Changing the Location of the Proposed Bayshore Freeway in the Vicinity of the San Francisco Airport

File

Relocated Highway opened to traffic Jan. 5, 1948

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PUBLIC UTILITIES COMMISSION

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E. G. CAHILL, Manager of Utilities

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San Francisco Public
Utilities Commission.
Necessity of changing
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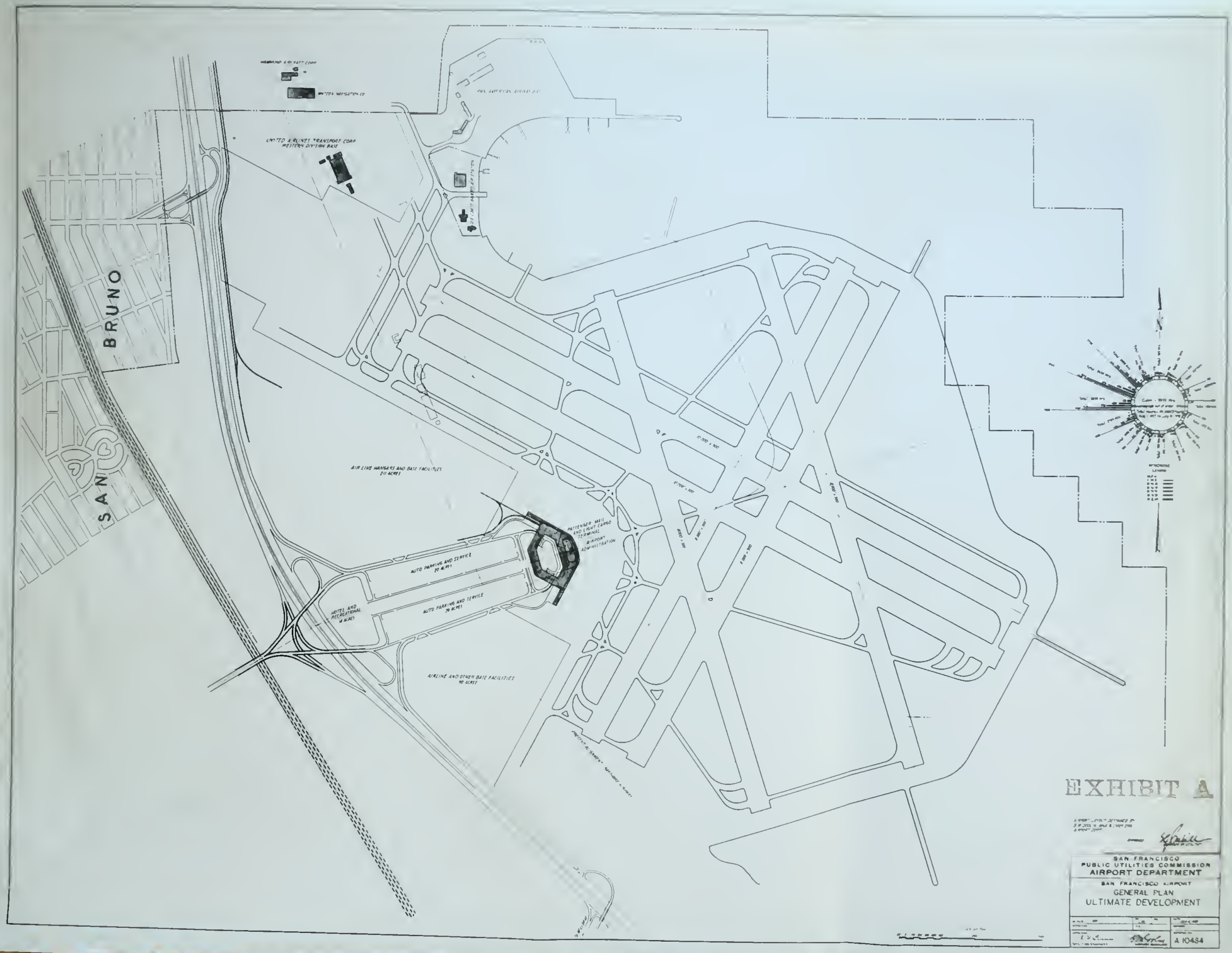
SAN BRUNO
UNITED AIRLINES TRANSPORT CORP
WESTERN DIVISION BASE
AIR LINE HANGARS AND BASE FACILITIES
211 ACRES
PASSENGER MAIL
AND LIGHT CARGO
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AUTO PARKING AND SERVICE
70 ACRES
HOTEL AND
RECREATIONAL
14 ACRES
AIRLINE AND OTHER BASE FACILITIES
90 ACRES
EXHIBIT A
SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
AIRPORT DEPARTMENT
SAN FRANCISCO AIRPORT
GENERAL PLAN
ULTIMATE DEVELOPMENT
A 10484

REPORT OF THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION

ON

Necessity of Changing the Location of the Proposed Bayshore Freeway in the Vicinity of the San Francisco Airport.

The California State Highway Commission in July, 1940, proposed a reconstruction, widening and partial realignment of the existing Bayshore Highway to establish a freeway between San Francisco and San Jose.

The plans included a number of expensive abandonments and realignments, such as construction of an earth fill directly across Brisbane Bay to connect Sierra and Candlestick Points. On that portion of the highway which passed through San Francisco Airport property, however, for a distance of one and three-eighths miles, creating a serious traffic hazard and further retarding the expansion of the airport to the west, no such realignment was proposed.

Assuming this to have been an oversight, the Public Utilities Commission made known its objections to the Highway Commission's plans and pointed out that:

(1) The Public Utilities Commission had acquired 550 acres to the west of the existing highway to provide adequate areas for construction of new hangars, buildings and extensive ground facilities to meet the phenomenal increase in air commerce demands.

(2) The proximity of the existing highway to the airport runways had already proven itself to be so dangerous as to have caused a staggering toll of fatalities and that the widening, heightening and clover-leafing of the existing facility would not only worsen this condition, but would render the western 550 acres wholly useless for expansion purposes.

The Commission exhibited to the State highway engineers tentative plans and studies then in process of development and proposed that in view of the magnitude and permanency of the State's freeway plan, that the State, in turn, envisage the present and future requirements of the airport which would ultimately make removal of the freeway to the west imperative.

Several meetings were held between representatives of the two agencies, but except for one survey and estimate of cost of realignment of the freeway to the west, the State highway engineers appeared unconvinced of the soundness of the City's position for approximately three years.

Early in 1943, the San Francisco Chamber of Commerce, which, in common with all farsighted groups, supported the State's proposal for construction of the freeway, recognized the nature of the impasse, and requested and received from the City its plan and studies for realignment. These were also furnished the State's engineers for their study and review.

Although the State engineers requested and received from the City additional engineering data, they made no comment or formal reply to these studies until November 18, 1943, at which time they submitted to the City, the Chamber of Commerce, The Down Town Association and numerous other agencies and organizations, a report entitled:

"REPORT ON FEASIBILITY OF SHIFTING SAN FRANCISCO MUNICIPAL AIRPORT (MILLS FIELD) TO THE SOUTHEAST."

Thus, after more than three years, the State engineers are brought into tacit agreement with the City's contention that the highway as now located is a barrier to necessary airport expansion. In fact, so thoroughly are they in agreement with this contention that they propose the remarkable expedient, not of shifting the highway, but of shifting the airport.

The problem is that of weighing and determining the respective merits and costs of a shift of the highway to the west, or a shift of the airport to the east.

A shift of the highway to the west would merely lengthen the freeway to San Jose by 1400 to 2000 feet, while a shift of the airport on the basis of ultimate plans not approved by the Civil Aeronautics Administration might disrupt air connections between San Francisco and all the rest of the nation.

RELATIVE MERITS OF PROPOSALS

The State proposes, as a logical method of obtaining adequate ground area for airport expansion purposes, the removal of the entire airport southeast, a sufficient distance so that enough new area east of the present highway can be developed to offset loss of the 550 acres the City already owns west of the highway, and which would have to be abandoned for airport purposes.

This proposal, regardless of its feasibility as to long-range effects, entirely overlooks the necessity of setting aside

suitable areas right now for long-term lease to aircraft operating corporations for terminal and base facilities. Such areas must be directly accessible to the flying field proper and must fit into a carefully studied plan.

The City has such a plan. This plan, not only meets the above and other requirements, but it has been analyzed and endorsed by the Federal authority created expressly to foster, regulate and control all civil air commerce, airports and air navigational facilities--The Civil Aeronautics Administration.

The State has two plans. Neither of them meets the above requirements and neither of them has been endorsed by the Civil Aeronautics Administration. And, apparently, in preparing these plans, the State did not attach much importance to the practical financing and construction aspects of the whole situation.

The City's ultimate plan is not envisioned as a project to be built in one continuous operation, but one to be constructed step by step as additional needs arise, using foresight to arrange a program so that successive units will be ready for use in the order of need without undue interference with existing operations.

THE STATE'S ALTERNATIVES

Plan "A": Reclaim 240 acres of additional tideland to the east at a cost of $200,000 less than the cost of the City's ultimate plan.

Plan "B": Reclaim 380 acres of additional tideland to the east at a cost of $900,000 more than the cost of the City's ultimate plan.

It is freely admitted that it is feasible to undertake either of these reclamation projects.

The City does not agree, however, that this can be done "at approximately the same cost as that involved in construction of the airport following the City's ultimate plan," nor that the land made available outside the runway strips would be acceptable to the City or to the C.A.A. in substitution for the City's land west of the present highway.

The State engineers found it necessary, in order to justify a shift of the airport, to criticize the City's ultimate plan from a strictly aeronautical and operational standpoint and to claim superiority for the alternative plans they offer. They pro-

pose an immediate construction of the field fill in excess of that necessary for the City's first development. Runway layouts were redesigned to minimize the additional area required for shifting the airport to the southeast. Areas between runways were designated as available for airport buildings, parking, industrial use, etc., without due regard for taxiway traffic patterns and locations.

The highway location proposed by the City was condemned because of its slightly greater length and alleged greater construction costs.

In short, the State's scheme for development of the airport was adjusted all along the line to reconcile its views as to the feasibility of a shift of the airport with its views against a shift of the highway.

In the course of making these several adjustments, the State failed to supply accurate details as to estimated costs. Even if the State's proposal to construct the whole field fill in one operation were to be followed, their estimates of cost should be substantially increased. Using the City's experience for the past decade and the known costs of such work, and applying the logical principle --- that the areas to be added to the existing field must also be made progressively, the excess of the estimate of cost of State's Plan "A" above the City's plan would be $4,539,235 and of State's Plan "B" above City's plan $5,837,714. (See Exhibit "B").

STATE'S PROPOSAL AND OBJECTIONS AND CITY'S POINT BY POINT REPLY

1. The State contends that realignment of the Bayshore Highway to the west would involve additional highway construction costs of from $500,000 to $1,000,000; that this lengthening of the free-way by 1400 to 2000 feet would cost motorists an additional $2,000,000 over the next 20 years.

City's Reply: No details supporting the estimate of added costs of construction were presented by the State. The spread of $500,000, or one-half the maximum estimate, however, suggests that these figures did not result from consideration of detailed estimates of the cost for the additional 1400 to 2000 feet, and neglected consideration of the advantages of the firmer foundation available west of the present location.

In any event, the Public Utilities Commission has expressed a willingness to pay its fair share of the costs of the

proposed realignment. The State has not suggested that it pay any part of the additional costs which would be involved in a shift of the airport in order to avoid realignment.

Details were not furnished in support of the State's round sum estimate of $2,000,000 in 20 years as the cost to motorists if they had to drive from 1400 to 2000 feet farther over the freeway under the City's plan.

The fact remains, however, that this is at the rate of $100,000 per year for 1400 feet, which is at the rate of $71.42 per foot per year, or at the rate of $50 per foot for 2000 feet. At this rate, the total cost to motorists driving between San Francisco and San Jose on this freeway alone for the next 20 years would be from $253,000,000 to $362,000,000.

Even assuming that the astronomical implications of application of this yardstick are correct, no account is taken of the consequences of the cure. The State's proposal to shift the airport instead of the highway will merely cause these added costs to break out in another place. The State's plans would so isolate the airport passenger and terminal buildings that the plane-taxiing distance would be increased by one-half mile for all transport movements at an average cost of 75 cents per mile per plane of the present average size.

Inasmuch as the State highway engineers have underlined their views as to the future size of the aircraft in order to substantiate their criticism of the City's plan for ultimate development of the airport as unsuited to the operation of the huge planes, this cost per mile should be revised to a minimum of $1.25, which is the estimate of cost by the Chief of the Air Traffic Control Division of the Civil Aeronautics Administration.

It is the contention of the City that the added cost of moving planes, plane service, equipment, personnel and other facilities over an added one-half mile would far exceed the $100,000 per year cost to motorists claimed by the State by reason of a highway extension of from 1400 to 2000 feet.

2. The State says: "It is feasible to reclaim 240 acres of additional tideland and shift the runways to the southeast at approximately the same cost as that involved in constructing the airport following the City's ultimate plan. Plan "A" will provide safer and better air transport facilities than the City's plan which does not meet the minimum glide angles required by the Army, Navy or C.A.A."

City's Reply: Appended hereto are exhibits showing that abandonment of the City's plan in favor of Plan "A" would not involve the same approximate costs but would instead increase the City's cost by $4,539,235, without reference to all other disadvantages.

As to provision of "safer and better transport facilities" and conformance to glide angles as required by various agencies, including the Civil Aeronautics Administration, this is best covered by the endorsement of the City's plan by the C.A.A., which presumably is in a better position than the State highway engineers to know its own glide angle requirements.

The full report of the C.A.A., (Exhibit C), signed by H. A. Hook, Regional Manager, in which it endorsed the City's plan, is attached hereto. Pertinent excerpts are herewith quoted:

> "In response to your request for a review of the plans pertaining to the proposed ultimate development of the San Francisco Airport, the Superintendent of Airports and Safety Regulations have studied the material at hand and have conferred with me and our joint comment is accordingly cited hereinafter.....
>
> "First, it is our belief that the plan has definite merit because practical experience at this, and similar airports, conclusively demonstrates the inadequacy of existing facilities. The need for parallel runways and larger aircraft parking and loading aprons is obvious and it is also self-evident that there is today virtually no additional building space if we contemplate a well balanced and carefully integrated airport.
>
> "Second, the layout portrayed...is well balanced and comparable to designs for similar proposed terminals. The peculiarities of the site do not make feasible consideration of unconventional layouts, the worth of which are currently and for the most part, theoretical.
>
> "Third, the approach zones to the runways are...
>
> "SE approach...unlimited.
> "NE approach...unlimited.
> "NW approach...meets current standards for instrument landing runways and should meet all future standards for contact operations.
> "SW approach...meets current standards for contact operations.

"NNW approach...meets current standards for contact operations.

"SSE approach...meets current standards for instrument landing runways and should meet all future standards for contact operations.

"...We do not contemplate necessity for sealevel runways of more than 7000 feet for normal civil domestic purposes within what can be termed a reasonable forecasting span of years. Notwithstanding predictions of future commercial aircraft requirements, we are certain that the use of specialized military equipment, which could not necessarily be operated safely and economically over regular civil routes, has, to a large degree, influenced such predictions.

"While we do not say that longer runways will not be needed for certain specialized operations, and further, may have merit by virtue of increasing safety factors, we do believe that the plan submitted, showing as it does, both eight and ten thousand foot runways, can be safely termed "satisfactory" insofar as approach zones are concerned.

"...It is apparent that either the NE or SE approaches--both unlimited--could be used for virtually all (instrument landing) operations.....If we take into consideration the belief that most carrier aircraft will be of tricycle landing gear design, and, therefore, not so susceptible to cross winds, it may be stated, that for all practical purposes, the SE approach (unlimited) could be used for all instrument landings....

"...The NNW and SSE approaches should definitely continue to meet contact requirements.

"It is therefore our belief and opinion that Drawing A-10484 represents an entirely practicable long range plan for the San Francisco Airport and...we do not hesitate to endorse it at this time, with but one physical qualification..."

(This qualification refers to the power lines in the NW zone and is treated below).

3. The State presents in its report a chart showing that the distances from the ends of the runways to the high tension towers northwest of the field are, for the most part, greater under its Plans "A" and "B" than under the City's plan.

City's Reply: The power lines must eventually be relocated in any event, not only for reasons of approach clearance for future instrument "blind landing" installation, but also to eliminate the dangerous interference with airport radio equipment that these power lines cause.

The C.A.A. letter, above quoted, states in this connection:

"The power lines located in the NW zone should be relocated one half or more miles distant..and said relocation should be concurrently pursued with efforts to establish enforceable zoning ordinances and to secure relocation, if practicable, of the power lines in the SW and SSE zones to insure recognition of the area as an airspace reservation in connection with an air terminal."

4. The State claims that it is feasible to reclaim 380 acres of additional tideland and shift the runways to the southeast under Plan "B" at a cost of "about $1,000,000 more than the expense involved in constructing the airport as proposed by the City..." The State adds that this plan "will provide much safer runway approaches and 522 acres of ground suitable for expansion...which is 39 acres more than provided by the City's plan."

City's Reply: As stated heretofore and substantiated by attached exhibits, the City contends that the additional cost of this alternative over the City's ultimate plan would be $5,837,714.

As to the additional safety of runway approaches, the Public Utilities Commission rests on the acceptance by the C.A.A. of the City's plan, which is practically unqualified, whereas the plans of the State appear to fall into the special category referred to by the C.A.A. as "unconventional layouts, the worth of which are currently and for the most part theoretical."

As to the claims for 39 acres more of area that would be available under Plan "B" than the City's plan, they cannot be substantiated by the facts which are apparent upon study of the State's proposed runway layout. The 140 acres located between the runways adjacent to the seaplane channel would not be usable nor useful for expansion purposes. The greater portion of this area would, instead, be consumed by taxiways.

5. The State claims that a shift of the runways to the southeast would encounter a shallower depth of mud than in the location proposed by the City.

City's Reply: There is nothing in the data submitted by the State to substantiate this claim. To make the additional fill, as proposed by the State, it would still be necessary to fill the areas included within the ultimate plan of the City. Further, the State's Plan "B" involves additional fill in a location which the City's experience has indicated is the most expensive and difficult of the terrain involved. This is the large area added in an easterly direction along the seaplane channel to provide space for the northerly part of the State's proposed NE-SW runways. Although the State made borings to prove the feasibility of moving the airport southeasterly, it made none to test the foundations for this section.

6. The State declares that "construction of a freeway along the line of the present Bayshore Highway will not seriously restrict the enlargement of Mills Field."

City's Reply: It will not only "restrict," it will stop the enlargement of the airport unless the City adopts one of the State's two alternative plans. If, as pointed out in the foregoing, the City should adopt either of these plans, it will be helpless in its efforts to set aside now areas for development of terminal facilities for additional air lines. Transcontinental and Western Air, Western Air Lines and others will be forced to look elsewhere for proper terminal sites to the great detriment of the lines, of this district and of the travelling public.

7. The State claims that the "principal runway (WNW) must in any event be moved and extended to the southeast in order to provide safer approaches."

City's Reply: This claim is wrong on all counts.

First, the runway already has a zero glide angle, over water approach.

Second, this runway cannot be moved under any circumstances since its direction is fixed by the contour of the range of hills to the west and the direction of the prevailing winds.

Third, the extension of this runway, under the City's plan, has been endorsed by the Civil Aeronautics Administration.

Fourth, such extension will meet any and all requirement as should be realized by the fact that the Army Air Forces with Federal funds are preparing to make an immediate extension of 3000

feet along the line of this runway.

8. The State's estimate of costs of the several plans takes into consideration only the cost of the fill, evidently assuming that other costs would be the same for both the State's and the City's plans.

City's Reply: The State overlooks the major problem of adequate taxiways to provide proper circulation of aircraft on the ground and access to points of landing and take-off, which, in the State's plans would greatly exceed in length those proposed in the City's ultimate plan. The State also has neglected to take cognizance of the added cost of the field drainage, lighting, electric supply lines and other facilities.

CITY'S IMMEDIATE CONSTRUCTION PROGRAM

Since the initial construction, San Francisco airport has been further developed by two successive major steps in the past decade--a 38 acre addition in 1936 and a 380 acre addition completed in 1940. A third by the United States Navy now under way adds 80 acres north of the seaplane channel. This step construction has been followed as being the most economical method of making improvements and additions, and it is the policy of the Public Utilities Commission to continue this method.

The United States Army Engineers, under agreement with the City, are now planning the next major addition to the field, which will be an extension of the NW-SE, or prevailing wind, runway. This work will involve a 103 acre fill, 1500 feet wide and 3000 feet long added to the southeasterly tip of the airport, and construction of a runway on this fill, providing a prevailing wind runway 8000 feet long. The field fill, only, on this addition is estimated in cost at $2,700,000 or $26,000 per acre.

United Airlines and the City are now negotiating a lease for additional area to provide for expansion of the company's division headquarters facilities. The full use of the proposed enlarged area makes imperative a realignment of Bayshore Highway.

The next step will be to provide airline hangar and base facilities for other operating companies. The assignment and development of such area will require two actions, namely:

(1) Realignment of the highway, and

(2) Reconstruction of the present NS and NE-SW runways in locations proposed in the City's ultimate plan.

An attached drawing shows that these runways can be built to usable lengths in the ultimate locations at a relatively low cost, as the greater length of each crosses the existing field.

When the two above-named actions are taken, all areas so designated on the attached drawing will be made available for the construction of airline hangars and base facilities, auto parking and service, and terminal and administration purposes.

All these factors point to the need for a prompt decision on the highway realingment problem.

CITY'S PLAN

Attached are a general map (Exhibit D) of the airport (Map 1) and two overlay maps (2 and 3). Map No. 1 shows the main features of the City's ultimate plan for the airport, on which the present field and the addition now being made by the Army are accentuated. The boldfaced outline shows the airport as it will appear when the Army addition is completed, and in which condition it will remain for the duration.

Map No. 2, the first overlay of Exhibit D, shows an addition to the field, including reconstruction of the NS and the NE-SW runways, and the relocation of the Bayshore Highway as advocated by the City. All these features, it will be noted, conform to the ultimate plan shown in light printing on Map No. 1 below.

It is the City's intention to make the improvements shown on Map 2 as soon after the war as presently critical materials are available for this work. Detail studies and estimates are now being made. This is the first vital step and the minimum work necessary to permit full utilization of the airport properties, and particularly to provide areas for hangar and base facilities.

Map No. 3, the second overlay of Exhibit D, shows the same improvements as are shown on Map 2 and described above, but in a location conforming to the design of the Airport as proposed by the State engineers in their Plan "A." As has already been pointed out, the estimate of cost for the construction of the improvement on this plan (providing the same facilities as Map 2) would be $4,539,235 greater than the cost for the same facilities built in accordance with the City's plan. The State's Plan "B" is more extensive and expensive than its Plan "A."

Looking at the three drawings together, other objectionable features to the State's plan are:

1. Practically all the State's runways would be on newly made ground, whereas large sections of the runways under the City's plan would be on existing filled areas.

2. Anchoring of terminals and headquarters in the northwest corner of the field increases taxiing operations one-half mile. The State's location of the terminal with relation to the prevailing wind runway is bad.

3. To construct the improvement in accordance with the State's plan, the field fill for construction in accordance with the City's plan still must be made.

4. It is plain to be seen that if the State's plan for expansion is adopted, on a site alleged to have a firmer foundation, it will, nonetheless, make necessary a fill of existing property in order to make the area proposed by the State available.

SAFETY

The movement of planes both on the ground and in the air and various other airport activities serve to distract the attention of Bayshore Highway motorists from the road and as a result the record for this short section of highway is one of the worst in the State of California. The length of the collision list with its consequent injuries and fatalities is appalling. The City's plan provides for a proper separation of the highway from the more active portion of the field and will tend to mitigate this hazard.

CONCLUSION

1. The Public Utilities Commission is confident that with the assistance and collaboration of the State, the San Francisco Airport will, in a short time, rival the world's finest air terminals in facilities, activity and international importance in air commerce to the perpetual benefit of the San Francisco metropolitan area, the State of California and the nation as a whole. It is convinced that now is the propitious time for the State to make this comparatively minor and inexpensive modification of its freeway plans, as requested by the City to permit logical development of a major airport.

2. The Commission is further convinced that if this realignment is not made now, that to make available the excluded 550 acres of land to the airport will inevitably require the relocation

proposed unless the imperative needs for proper expansion of this one airport owned by the City are to be denied. Relocation after completion of the freeway would be enormously more expensive and inconvenient to the public.

Even assuming that the State's figures are correct in estimating maximum costs of shifting the highway to be $1,000,000 and the maximum costs of State's Plan "B" to be $1,000,000 over the City's plan, it is still essential that the highway rather than the airport be moved. This is true because the airport will need all the expansion area available. It cannot afford to lose the 550 acres it now has and will eventually need that area and all the additional area that could be developed under the State's plans. The additional cost to motorists of a longer highway are more than offset by the additional costs to aircraft operators of longer taxiways under the State's airport plans.

3. The Commission is ready and willing to collaborate to the fullest reasonable extent with the State to settle at once their joint problem so that both the State's and the City's projects in the public interest shall be cleared of jurisdictional, legal and technical obstacles to their consummation.

4. The Commission is ready and willing to make such modifications in its present master plan for the development of the airport as will best meet the engineering requirements for relocation of the freeway along the general alignment proposed by the City without unduly hampering the development of the airport as already analyzed and endorsed by the Civil Aeronautics Administration.

5. The Commission will undertake to develop ways and means of financing the City's proper share of expense of the relocation it proposes.

6. Such proper share, in the Commission's opinion, should be the donation of the widened right-of-way necessary for the new free-way and the total cost of constructing an equivalent width of the present highway on the new right-of-way.

The Commission takes the position that since it provided the engineering service, obtained the rights-of-way through its legal and real estate departments, donated the present right-of-way through its own airport property and paid the total cost for construction of the present highway within the limits of City-owned property, the proposition set forth in the above paragraph is fair and equitable.

7. The Commission suggests that the State should return to the City a deed in fee simple for the present right-of-way of the Bayshore Highway in exchange for a deed to the State of the proposed new right-of-way through City-owned property.

8. Pursuant to the above, the Public Utilities Commission urges that a meeting be held immediately by authorized representatives of the City and State to settle this controversy without further delay.

March 4, 1944

E. C. CAHILL
Manager of Utilities

APPROVED:

PUBLIC UTILITIES COMMISSION

Marshall Dill, President

Sam McKee, Vice President

W. I. Kohnke

Lloyd J. Cosgrove

Daniel F. Del Carlo

P. U. C.
Bur. of Eng.
2/16/44

EXHIBIT B

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO AIRPORT

ESTIMATES OF COST FOR FURTHER DEVELOPMENT
February 16, 1944

Herewith are presented estimates of costs for the initial step in a progressive program of expansion and development of San Francisco Airport, including all necessary facilities for the proper operation of a terminal airport. Three estimates are presented, as follows:

1. Estimate of initial development based on ultimate plan proposed as shown on drawing A-10484 dated October 14, 1943,

2. Estimate based on a plan developed by Engineers of the State Highway Commission, designated as "State Plan A",

3. Estimate based on a plan developed by Engineers of the State Highway Commission, designated as "State Plan B".

Actually the State Engineers, in their report on this matter, considered the ultimate development of the airport rather than the initial step; but as progressive development is considered the only logical program by the City's authorities, the estimates now presented are on the basis of initial development and not ultimate.

The essential difference between the City's plan and the State's two plans is that the City's plan requires the relocation of Bayshore Highway along an alignment west of the present location, so as to permit use of the City's land west of the present highway location, while the State plans would shift the airport itself eastward, maintaining the present highway alignment and providing additional building area east of the present highway alignment, leaving the City's west land still unavailable for airport purposes and for airport auxiliaries by reason of the severance.

The essential difference between the State's plans A and B is that in Plan B the area available for buildings, parking, etc. is greater than in Plan A, but in the opinion of the City's engineers this carries no advantage commensurate with the increased cost, because the increase in area is unfavorably located.

Estimates submitted by the State Highway Engineers for comparison of the various plans have taken into account only the difference in the cost of fill necessary to provide land area which they consider equivalent to the land area that will remain severed from the airport field if the highway is not relocated. The estimates here presented include not only fill, but also runways, drainage, lighting, buildings, and all other elements necessary to make

a complete airport. The initial plan provides all classes of facilities that are required in the ultimate development, the difference being one of extent only.

The runways provided in all of the three plans above enumerated are of about the same length as the runways of the existing field, in approximately the same directions respectively. The elevation of the existing field in each estimate, however, is to be increased, and the new fill beyond the existing field will be sufficient to provide properly for future settlement and for satisfactory drainage under all conditions, with minimum resort to pumping. In the City's plan, development of the land now owned by the City west of Bayshore Highway is included to the extent of providing fill and drainage facilities necessary to make the land available for building and other developments such as have been contemplated for that land.

The estimate for the City's plan includes also purchase of additional land west of the present highway, and an assumed sum as a contribution by the City to the excess cost of constructing the highway on the proposed new alignment.

It is believed that the estimates prepared give a fair comparison between the City's plan and the State's suggested plans.

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO AIRPORT

ESTIMATE OF COST FOR INITIAL DEVELOPMENT
OF ULTIMATE PLAN SHOWN ON DRAWING A-10484 DATED OCT. 4, 1943

(It is assumed that the southerly fill 3000 feet long and 1500 feet wide, and the improvements and extension of Runway 10-28, with pavement, contact lights and drainage, will have been completed before this "Initial Development" is undertaken.)

Item No.	Description	Quantity	Unit Cost	Total Cost
1.	FILL: earth fill to reclaim 262 acres south of present field and raise the elevation of the existing field	9,610,000 c.y.	$ .70	$6,727,000
2.	PAVING: Runways 1-19 and 14-32; with asphalt pavement 200 feet wide	2,258,000 s.f.	.35	790,300
	Taxiways; with concrete pavement	2,535,000 s.f.	.50	1,267,500
	Aprons; with concrete pavement	2,662,000 s.f.	.50	1,331,000
3.	ELECTRICAL SYSTEM: Power receiving and distribution substations and distribution system			185,000
	Runway contact lights and taxiway guidance lights	220 units	300.00	66,000
	Communication system			25,000
4.	UTILITIES: Water service and distribution system	15,000 ft.	7.50	112,500
	Gas service and distribution system	8,000 ft.	1.25	10,000
	Sewage collection and disposal system			40,000
5.	DRAINAGE: Field grading, inlets and drainage pipes	525 acres	800.00	420,000
	Drainage pumping plants			75,000
	Rearranging drainage system for handling drainage from areas west of Southern Pacific R. R. entering Airport land			500,000
6.	UTILITY ROADS:	850,000 s.f.	.25	212,500
7.	PARKING AREAS:	800,000 s.f.	.25	200,000

[illegible]

[illegible]

Item No.	Description	Quantity	Unit Price	Total Price
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Item No.	Description	Quantity	Unit Cost	Total Cost
8.	BUILDINGS: New administration building (first section), hangar, field service building, and improvements for further use of existing buildings			$1,500,000
9.	LAND: Purchase of land south of present property and between the existing and proposed location of Bayshore highway	200 acres	500.00	100,000
10.	BAYSHORE HIGHWAY: City's proportion of cost for reconstructing highway, on Airport lands in the proposed location (assumed amount)			500,000
	TOTAL			$14,062,325
	CONTINGENCIES 5%			703,116
	TOTAL			14,766,441
	Administration and Engineering 10%			1,476,644
	TOTAL			$16,243,085

Item No.	Description	Quantity	Unit Cost	Total Cost
8.	[illegible]			[illegible]
9.	[illegible]	[illegible]	[illegible]	[illegible]
10.	[illegible]			[illegible]
	TOTAL			[illegible]
	CONTINGENCIES 5%			[illegible]
	TOTAL			[illegible]
	Administration and Engineering 10%			[illegible]
	TOTAL			[illegible]

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO AIRPORT

ESTIMATE OF COST FOR INITIAL DEVELOPMENT
OF STATE PROPOSAL "A" OF NOVEMBER 18,1943

(It is assumed that the southerly fill 3000 feet long and 1500 feet wide and the improvements and extension of Runway 10-28, with pavement, contact lights and drainage will have been completed before this "Initial Development" is undertaken.)

Item No.	Description	Quantity	Unit Cost	Total Cost
1.	FILL: earth fill to reclaim 591 acres south and east of the present field and raise the elevation of the existing field	15,658,000 c.y.	$ .70	$10,960,600
2.	PAVING: Runways 1-19 and 14-32:with asphalt pavement 200 ft. wide	2,228,000 s.f.	.35	779,800
	Taxiways:with concrete pavement	2,670,000 s.f.	.50	1,335,000
	Aprons: " " "	2,662,000 s.f.	.50	1,331,000
3.	ELECTRICAL SYSTEM: Power receiving and distribution substations and distribution system			185,000
	Runway contact lights and taxiway guidance lights	220 units	300.00	66,000
	Communication system			25,000
4.	UTILITIES: Water service and distribution system	19,000 ft.	7.50	142,500
	Gas service & distribution system	11,000 ft.	1.25	13,750
	Sewage collection and disposal system			40,000
5.	DRAINAGE: Field grading, inlets and drainage pipes	784 acres	800.00	627,200
	Drainage pumping plants			75,000
	Rearranging drainage system for handling drainage from areas west of Southern Pacific R. R. entering airport land			500,000
6.	UTILITY ROADS:	850,000 s.f.	.25	212,500

[illegible]

Item No.	Description	Quantity	Unit Cost	Total Cost
7.	PARKING AREAS:	800,000 s. f.	$ .25	$ 200,000
8.	BUILDINGS: New Administration building (first section), hangar, field service building, and improvements for further use of existing buildings			1,500,000
		TOTAL		17,993,350
		Contingencies 5%		899,668
		TOTAL		18,893,018
	Administration and	Engineering 10%		1,889,302
		TOTAL		$20,782,320

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO AIRPORT

ESTIMATE OF COST FOR INITIAL DEVELOPMENT
OF STATE PROPOSAL "B" OF NOVEMBER 18,1943

(It is assumed that the southerly fill 3000 feet long and 1500 feet wide and the improvements and extension of Runway 10-28, with pavement contact lights and drainage will have been completed before this "Initial Development" is undertaken.)

Item No.	Description	Quantity	Unit Cost	Total Cost
1.	FILL: earth fill to reclaim 693 acres south and east of the present field and raise the elevation of the existing field	17,155,000 c.y.	$ .70	$12,008,500
2.	PAVING: Runway 1-19, 14-32 and extension to 10-28: with asphalt pavement 200 ft. wide	2,225,500 s.f.	.35	778,925
	Taxiways: with concrete pavement	2,738,000 s.f.	.50	1,369,000
	Aprons: " " "	2,662,000 s.f.	.50	1,331,000
3.	ELECTRICAL SYSTEM: Power receiving and distribution substations and distribution system			185,000
	Runway contact lights and taxiway guidance lights	220 units	300.00	66,000
	Communication system			25,000
4.	UTILITIES: Water service and distribution system	19,000 ft.	7.50	142,500
	Gas service and distribution	11,000 ft.	1.25	13,750
	Sewage collecting and disposal system			40,000
5.	DRAINAGE: Field grading, inlets and drainage pipes	838 acres	800.00	670,400
	Drainage pumping plants			75,000
	Rearranging drainage system for handling drainage from areas west of Southern Pacific R. R. entering Airport land			500,000
6.	UTILITY ROADS:	850,000 s.f.	.25	212,500
7.	PARKING AREAS:	800,000 s.f.	.25	200,000

[illegible]

[illegible]

[illegible]

[illegible]	Description	Unit [illegible]	Quantity	Total [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Item No.	Description	Quantity	Unit Cost	Total Cost
8	BUILDINGS: New administration building (first section) hangar, field service building, and improvements for further use of existing buildings			$ 1,500,000
		TOTAL		19,117,575
		Contingencies 5%		955,879
		TOTAL		20,073,454
	Administration and Engineering	10%		2,007,345
		TOTAL		$22,080,799

Item No.	Description	Quantity	Unit Cost	Total Cost
[illegible]	[illegible]			

EXHIBIT C

IN REPLY ADDRESS
REGIONAL MANAGER
DEPARTMENT OF COMMERCE
IVIL AERONAUTICS ADMINISTRATION
500 Fourth Street
a Monica, California

DEPARTMENT OF COMMERCE

CIVIL AERONAUTICS ADMINISTRATION

IN REPLY REFER TO
FILE 18/50

January 25, 1944

Mr. B. M. Doolin, Manager
San Francisco Airport
San Francisco, California

Dear Mr. Doolin:

In response to your request for a review of the plans pertaining to the proposed ultimate development of the San Francisco Airport, the Superintendents of Airports and Safety Regulation have studied the material at hand and have conferred with me, and our joint comment is accordingly cited hereinafter. Drawings No. A-10490 and No. A-10491 are returned, herewith.

We have examined Drawing No. A-10484, dated October 4, 1943, showing the ultimate development; Drawing No. A-10491, dated January 10, 1944, showing the profiles of the extended runway centerlines as proposed in Drawing No. A-10484; and the San Mateo quadrangle sheet with data superimposed thereon, and identified as A-10490, under date of January 10, 1944. We have also taken into account the operating experience gained over a period of years, and we have likewise considered the airport as it exists today, illustrated on Drawing No. A-10312-C, dated April 14, 1942, and revised December 22, 1942.

The subject of long range planning for any air terminal is most absorbing and comprehensive. We shall not attempt in this analysis to suggest alternatives, but shall confine discussion to the information at hand.

First, it is our belief that the plan has definite merit because practical experience at this, and similar airports, conclusively demonstrates the inadequacy of existing facilities. The need for parallel runways and larger aircraft parking and loading aprons is obvious, and it is also self-evident that there is today virtually no additional building space if we contemplate a well balanced and carefully integrated airport.

Second, the layout portrayed on Drawing No. A-10484 is well balanced and comparable to designs for similar proposed terminals. The peculiarities of the site do not make feasible consideration of unconventional

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STAMPS

eight and ten thousand feet runways, can be safely termed "satisfactory," insofar as approach zones are concerned.

Referring again to "instrument landing" conditions, it is apparent that either the NE or SE approaches - both unlimited - could be used for virtually all such operations. Note No. 22, cited hereinbefore, covered forty-three thousand, eight hundred and twenty-four observations over a five year period, and showed that of the total of two and one-half percent of restricted visibility (one mile or less), ninety percent of such conditions were classed as calms (0-5 mph) or light winds (6-10 mph). Of the ten percent of restricted visibility winds in excess of ten miles per hour, either the NE or SE approaches could be used in all except those "one in a million" situations. If we take into consideration the belief that most carrier aircraft will be of tricycle landing gear design, and, therefore, not so susceptible to cross winds, it may be stated that, for all practical purposes, the SE approach (unlimited) could be used for all instrument landings. Again, aircraft likely to use this airport for so-called instrument landings will have the benefit of several alternates within fuel range, should an unusual local high velocity wind occur.

Not satisfied with Note No. 22, however, we have referred to other records, including the "Report on a Meteorological Survey of Proposed Sites for the San Francisco Municipal Airport" by Ernest E. Ecklund, Meteorologist, U. S. Weather Bureau, dated July 10, 1928, File No. A-531.10A. These studies confirm in every detail the assumptions of the preceding paragraph.

Again, in reviewing contact operations, it must be recognized that few approaches and take-offs are conducted on an indefinite straight in and out heading; that an approach is usually initiated out of a turn two to four miles distant; that a take-off ordinarily culminates in a turn beginning from one to three miles out. When we analyze these facts, we see that the NNW and SSE approaches should definitely continue to meet contact requirements. Only the SW approach, then, remains in what could be termed a dubious category, and when we bear in mind that the sole reason for this alignment is the alleged small percentage of high velocity winds under relatively good conditions of ceiling and visibility, the need for concern is not apparent.

It is, therefore, our belief and opinion that Drawing No. A-10484, dated October 4, 1943, represents an entirely practicable long range plan for the San Francisco Airport, and while we reserve the right to suggest lesser modifications of this plan and to similarly comment

upon or devise other proposals for the ultimate development of this facility, we do not hesitate to endorse it, at this time, with but one physical qualification, to-wit:

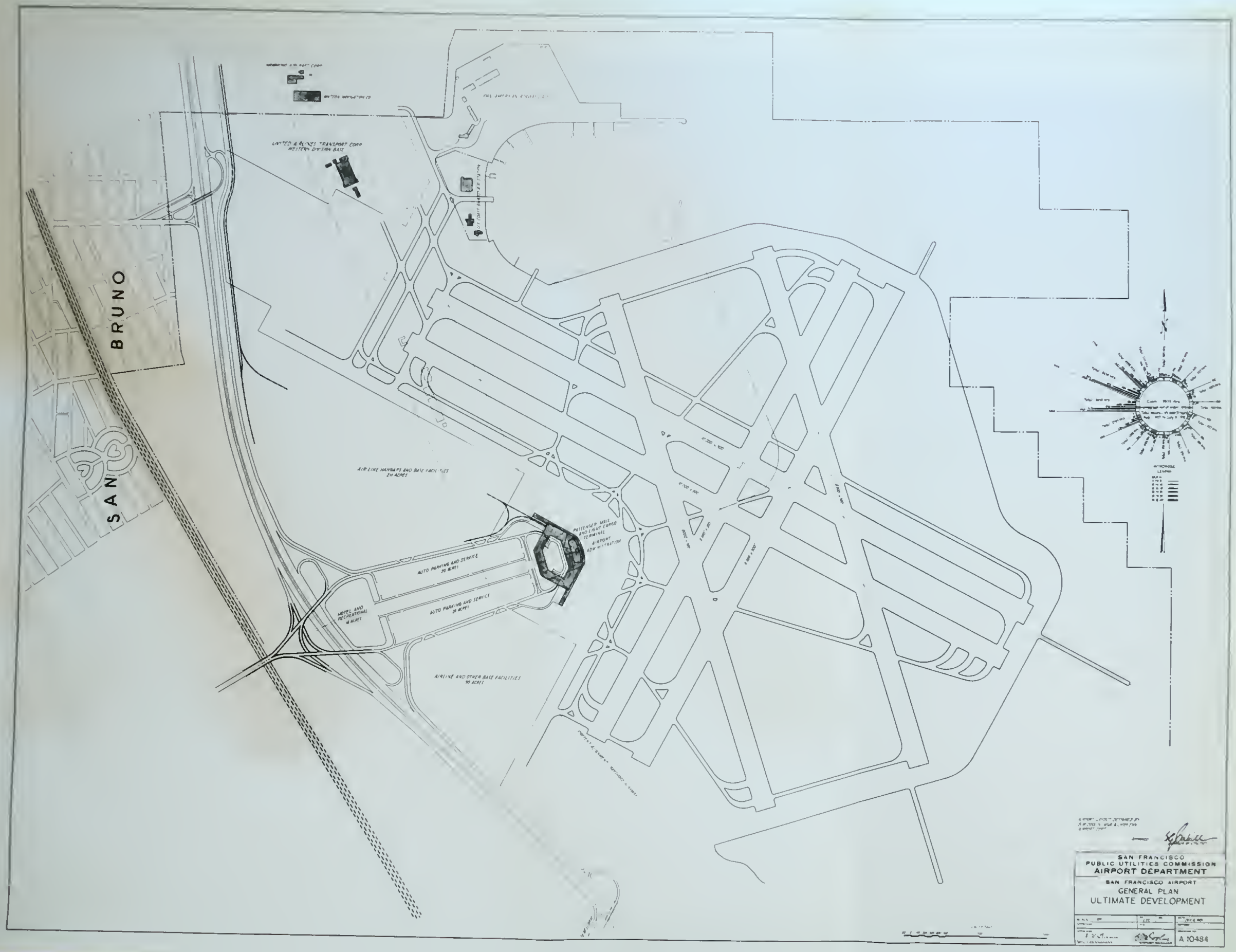
> The power lines located in the NW zone should be relocated one half or more miles distant, and said relocation should be concurrently pursued with efforts to establish enforceable zoning ordinances and to secure relocation, if practicable, of the power lines in the SW and SSE zones to insure recognition of the area as an airspace reservation in connection with an air terminal.

Very truly yours,

H. A. Hook

H. A. Hook
Regional Manager

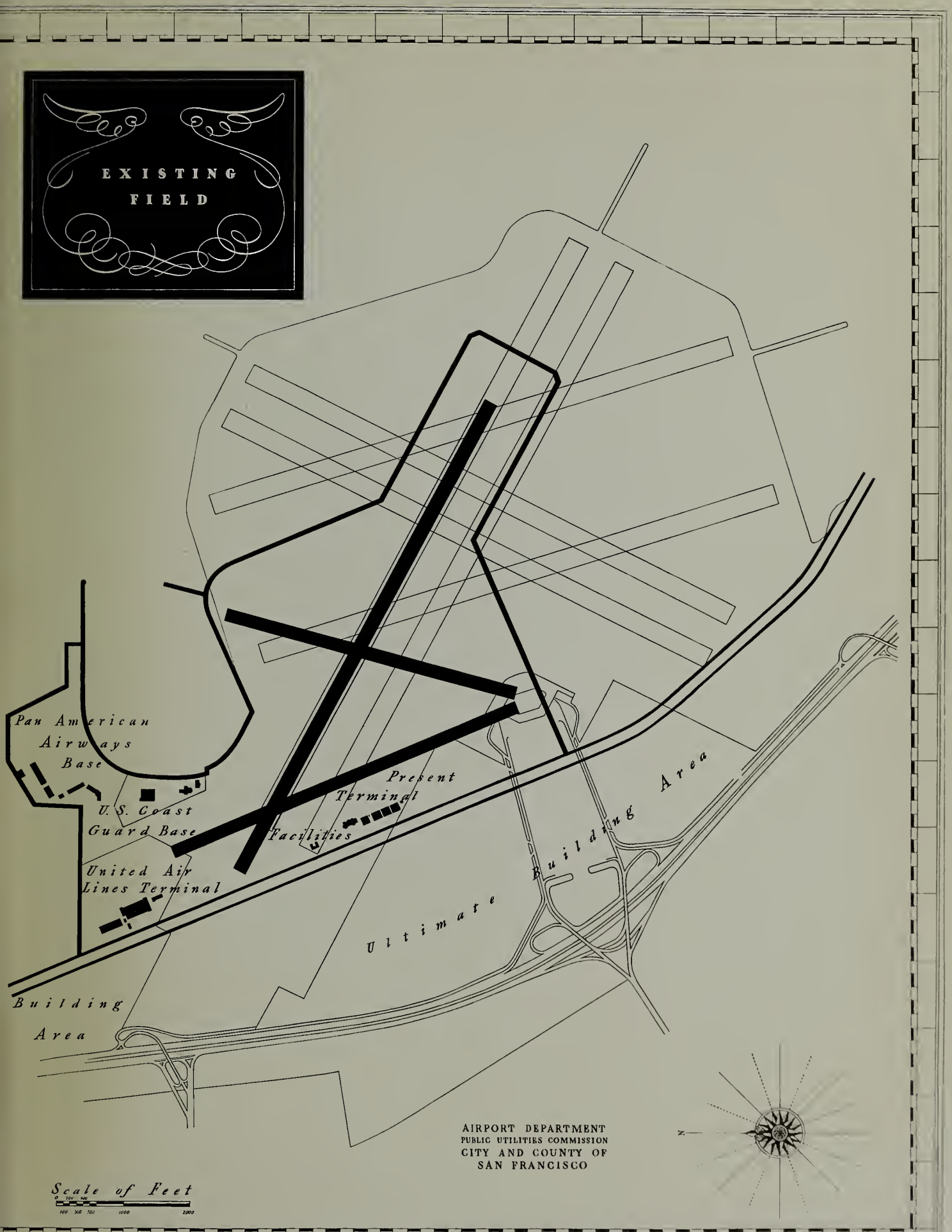
Enclosures (2)


SAN BRUNO
UNITED AIRLINES TRANSPORT CORP
WESTERN DIVISION BASE
AIR LINE HANGARS AND BASE FACILITIES
211 ACRES
PASSENGER MAIL
AND FLIGHT CARGO
TERMINAL
& AIRPORT
ADMINISTRATION
AUTO PARKING AND SERVICE
70 ACRES
AUTO PARKING AND SERVICE
70 ACRES
HOTEL AND
RECREATIONAL
4 ACRES
AIRLINE AND OTHER BASE FACILITIES
90 ACRES
SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
AIRPORT DEPARTMENT
SAN FRANCISCO AIRPORT
GENERAL PLAN
ULTIMATE DEVELOPMENT
A 10484

FIRST IMPROVEMENT
STATE PROPOSAL A

Building Area

EXHIBIT D


EXISTING FIELD
Pan American Airways Base
U.S. Coast Guard Base
United Air Lines Terminal
Present Terminal Facilities
Ultimate Building Area
Building Area
AIRPORT DEPARTMENT
PUBLIC UTILITIES COMMISSION
CITY AND COUNTY OF SAN FRANCISCO
Scale of Feet